3° Service Productivity

Services and productivity

- Think about these questions:
  - Is service productivity an oxymoron?
  - Can service productivity be measured?
  - What are some relationships between innovation and productivity?

Service Productivity

- What is productivity?
  - Measure of economic efficiency which shows how effectively economic inputs are converted into output
  - Ability to produce more goods and services with the same or less input (time/person)
- How to check if producing goods experience is also applicable to services?

Services Paradox

- Economy is increasingly moving towards services, ma if productivity growth in services is inherently sluggish, economic growth must inevitably slow?
- But productivity in services is up …

Baumol's Disease

- In 1967, the economist William Baumol argued that **most services were, by their nature, labor-intensive**
- The **perceived quality** in service industries often depends on how much labor is involved: *"Even after 300 years it still takes four musicians to play a string quartet"*
- Therefore, according to Baumol, for structural reasons related to the type of technological progress **there is a slow growth in the productivity of services**, and therefore a slow growth of the economy

Measuring Productivity

- Historically labor productivity was calculated to be the ratio of output per unit of labor input (persons or hours):

Labor productivity = (Output / Labor input*)

*Where labor input = people or hours

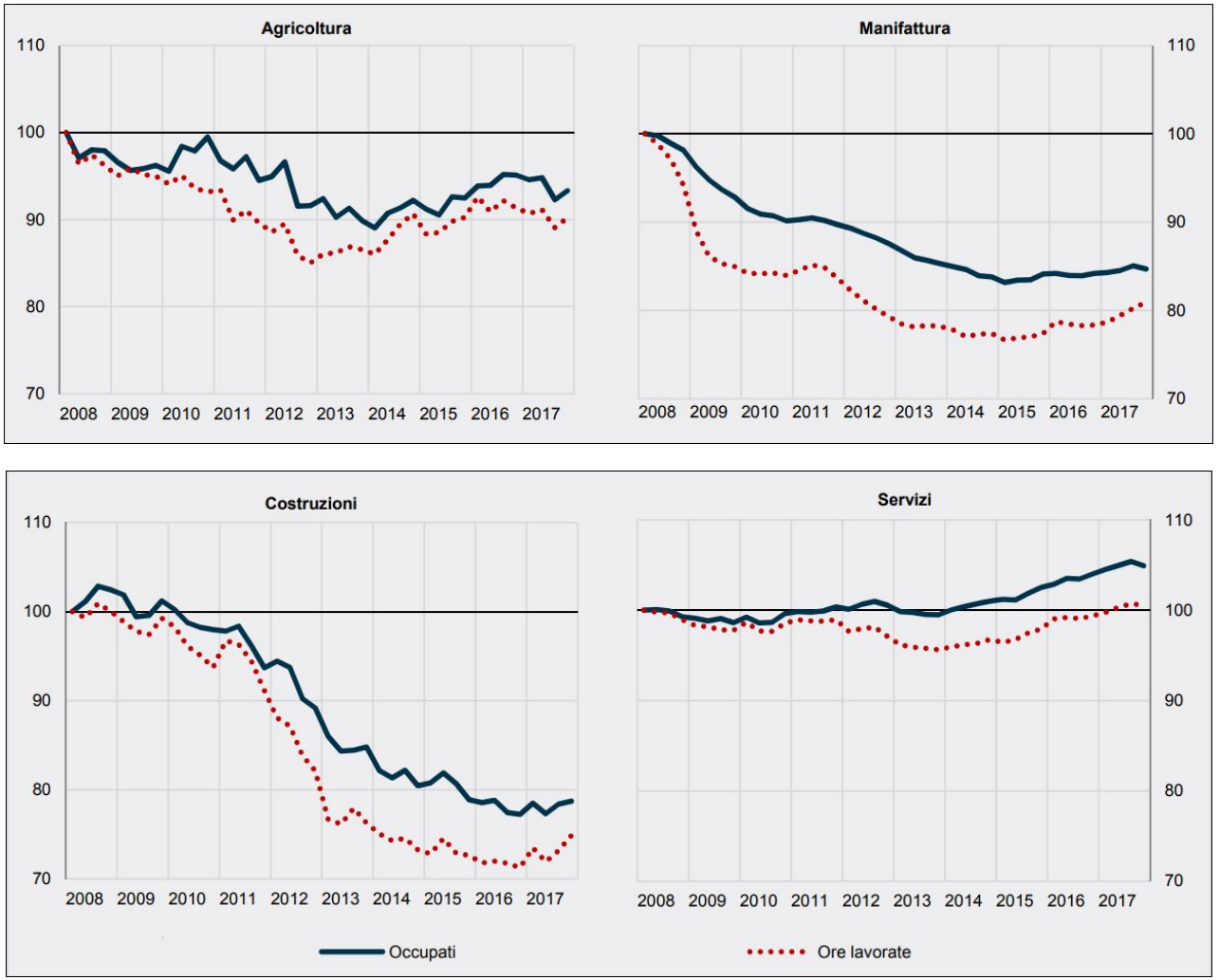
- A measurement exists for multi factor productivity (MFP) which is calculated as the output per unit of input (with input expanded to include labor, purchased inputs and forms of capital)

Multi-factor productivity = (Output / Labor input)**

**Where labor input = expanded to include multiple forms

Inputs in Services

Evolution of labor input by macro-sector: employed and hours worked - years 2008-2017



Measuring Services is a Challenge

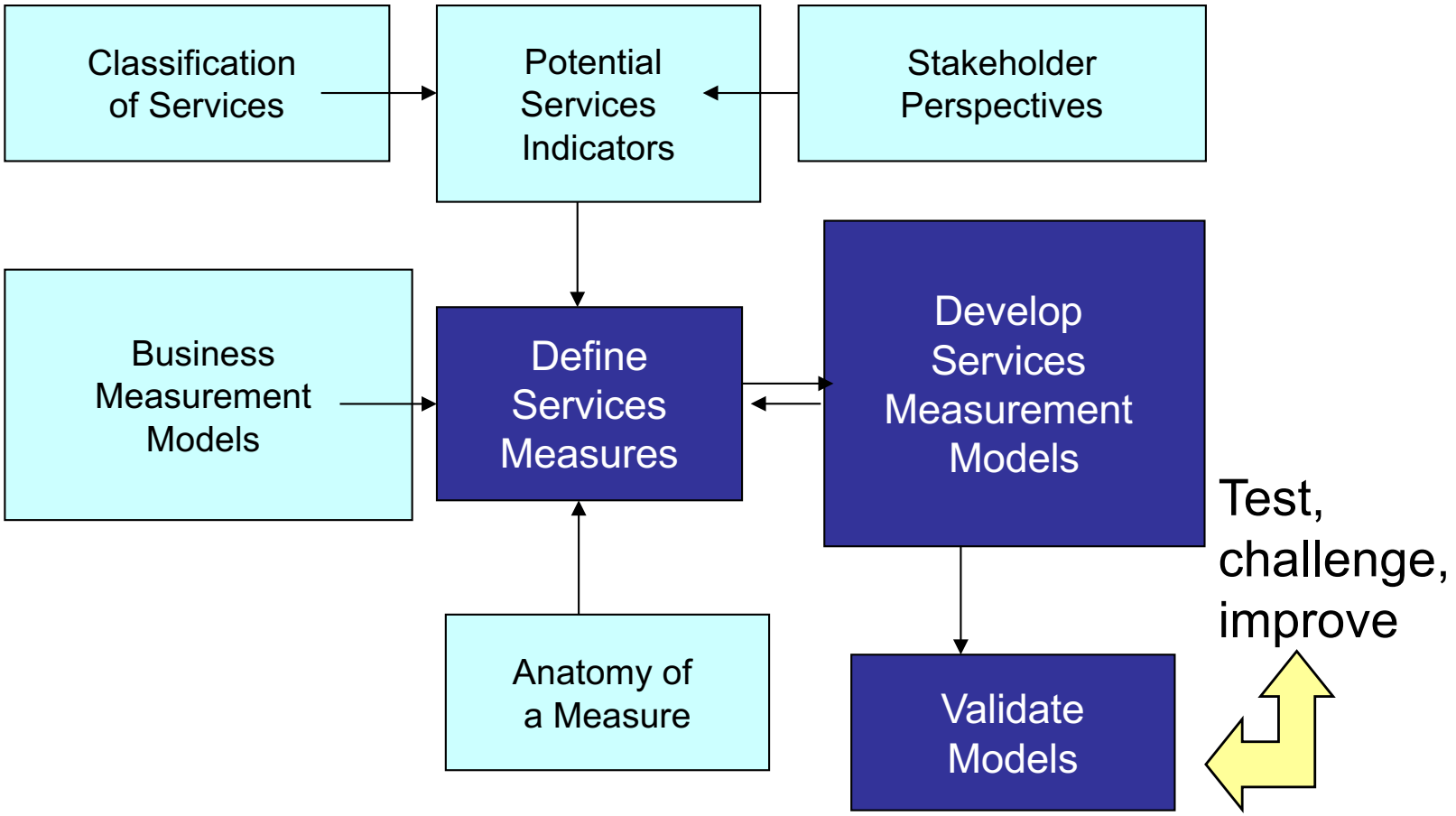
- A challenge is to apply formulas of manifacturing industry to services productivity
  - Especially taking into account that one of the determining factors of the services growth is **knowledge**
- A second challenge is to create a service **measurement model** that takes into account numerous indicators, many of which are intangible
- Productivity is different from efficiency, the latter is related to cost reduction
- Examples of productivity outputs:
  - Sales revenue
  - Projects completed
  - Hours of training completed
  - New products developed
  - …

Triplett-Bosworth: Productivity in Services

- In 2004 two Brookings Institution economists, Jack E. Triplett and Barry P. Bosworth, pointed out how most of the post-1996 growth in productivity has come in services, and that ***"IT may just be the cure for Baumol's disease"***
- They found that 24 out of the 29 service industries they studied exhibited growth in labor productivity after 1995,
- The service industries where overall productivity did not grow were hotels, health, education and entertainment, where costumers perceive more labor associated to higher quality

- **The contribution of IT** was therefore decisive in reviving the services productivity

Factors combining a Services Measurement Model



A Potential Measure of Services Productivity

$$\frac{\text{Output}}{\text{Labor} + \text{Capital}} = \text{Productivity}$$

Output

- Service outcomes
- Availability
- Quality
- Value
- Variability
- Accessibility
- Experience
- Prestige
- Satisfaction

Revenue

Value

- Price
- Flexibility
- Competitiveness
- Adaptability
- Innovation
- Focus
- Interchangeability

Input

- Capability
- Capacity
- Cost
- Cohesiveness
- Complexity
- Correction
- Efficiency
- Optimization
- Risk
- Process
- Resource levels
- Social capital
- Variability
- Waste

Employees
Total Cost

Examples of Indicators

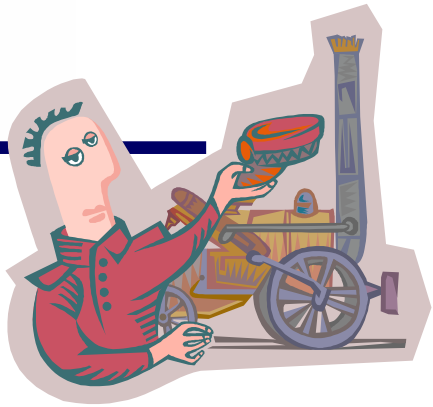
Services -- Software Providers – Key Indicators (Example Companies) and Metrics:

- Quality (Model: Monster.com, eBay)
  - Reliability
  - Performance
  - Ease of Use
  - Brand Perception
  - # of Active Users
- Innovation (Model: Google – Ad Service)
  - Novelty
  - Market Share Growth
  - Market Share secured from competitors
- Complexity (Model: Webex –teleconferencing services)
  - Barriers to entry
  - Market Share
  - Brand Perception

Innovation and Productivity

- What can we learn from manufacturing?
  - Producers of goods have reorganized to reduce costs, improve quality and increase adaptability to changing markets
  - Some service sector firms have adapted innovative work practices from manufacturing
- But if services emulate manufacturing models limit their innovation opportunities
  - New models need…

Engineering Model versus Interpretive Model



Engineering model

- Product design comes before process design
- Process predictable, repeatable
- Some key dimensions: product conformance, production cost, speed and variety

Interpretive model (Hertzenberg et al. 1998)

- Takes as problematic what engineering takes as given (product and production process)
- Workers develop skills in understanding customer wants and needs, they translate those into services they provide
- Process continuously adapts to the customer

(Herzenberg, S.A., Alic, J.A., Wial, H., (1998), New Rules for a New Economy, Employment and Opportunity in Postindustrial America)

The two Models

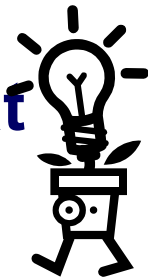
Engineering model	Interpretive model
Design comes before process	Product and process intertwined, Product design emerges from the process, not specified in advance
Workers execute tasks	Workers interpret needs and execute tasks
Improvements come from changes to design or process	Improvements follow from improving worker's ability to elicit and interpret, respond to the situation to select work practices from repertoire or learn or invent new services

Differences of Services with Goods Design

- In services, there is always a need for judgment (subjective aspect)
- Often the attributes of a service may be inseparable from the process of production (like a restaurant)
- Product design is often part of the production process
- Indeed, some services vary too much with the situation
- These differences do not permit the application of the engineering model to service design

Conclusions of Services Productivity

Hertzenberg points out that to improve performance and service measurement **we can not apply methods that worked in manufacturing** (no engineering model)



Other approaches are on this same position in the study of the services productivity, e.g.:

- Not only the specificities and differences of services with goods, but also the service activities associated with the production of goods are important -> **Servitization**
- Role of **knowledge in services** (KIBS knowledge-intensive business services - Ian Miles)

(Gadrey, J. and Gallouj, F., (2002) *Productivity, Innovation and Knowledge in Services, New Economic and Socio-Economic Approaches,* Cheltenham, UK: Edward Elgar)

KIBS and Productivity

- What is the output of a knowledge worker?
  - It cannot be measured only in lines of code
  - A distinction must be made between **output**, what one creates, and **outcome**, which is the added value of a knowledge worker
  - The formula becomes:

Productivity = outcome / input

"The most important contribution management needs to make in the 21st century is to increase the productivity of KNOWLEDGE WORK and the KNOWLEDGE WORKER." (Peter Drucker, 1982)

4° Knowledge and Services

IT Services Classification

- The Lovelock's classification (and others) were not designed taking into account the use of IT in services
- We need classifications with technological and information management implications and **knowledge dimension** (IT services)

Knowledge Economy

- *"Knowledge economy is an economy in which the production, distribution and use of knowledge is the main driver of growth, wealth creation and employment across all industries*" (OECD, 1996)

The Role of Knowledge in Services

- Knowledge intensity and ICT are factors of innovation
- Knowledge management and technologies become crucial strategies for service industry
- Different knowledge typologies:
  - *know-how, organizational, scientific-technical, informational, cultural, etc.*

Knowledge in IT Services

- Knowledge is **output** of service:

  Data collection, storage, modification, updating and dissemination of knowledge to create value for the customer: information services, communication, newsletters, information retrieval systems, high-tech products, online medical information …

- Knowledge is **placed in the supplier experience** (tacit knowledge), a unique, not repeatable and personalized result:

  consulting services, lawyers, doctors, R&D …

- Knowledge **is embedded into the process or service system**, the result is replicable, ICT is essential for extending service:

  automatic ticketing, online travel reservations, ATMs, web services (Amazon)

Kang Framework

"**Knowledge-based services** where value, knowledge, is the heritage of the person providing the service.

Knowledge-embedded services where value is inherent in the system that provides the service."

Knowledge-based services	Knowledge-embedded services
• Computer graphic	• Automated car washes
• Computer aided design	• Fast food
• Beauty salons	• Passenger/freight transportation
• Exercise clinics	• Laundry
• Haircutting	• Dry cleaning
• Education	• Vending machines
• Professional services	• Package delivery
• Legal services	• Shipping and distribution
• Health care	• Broadcasting
• Information services	• Telephone operator
• Management consultants	• Security services
• Accountants	• Banking/insurance
	• Theatres/museums
	• Travel/recreation

Kang, H., 2006, Technology management in services: knowledge-based vs. knowledge-embedded services

Examples from Kang

Knowledge-based	Knowledge-embedded
Computer graphic for publishing: technology supports (does not replace) the worker skills => greater speed, efficiency, repeatability and quality	Automatic vehicle wash: worker puts into operation the technology representing the added value of the service
Distance learning: teacher role remains fundamental, technology extends its ability to reach students	Orders and deliveries management: worker depends on technology helping him to manage orders, the customer interacts with the technology to monitor the status of the delivery

Knowledge Management, what is?

Definition:

*"Theoretical and application research developing the **knowledge cycle** within a community of practice or learning (in companies) through IT tools"*

Goal:

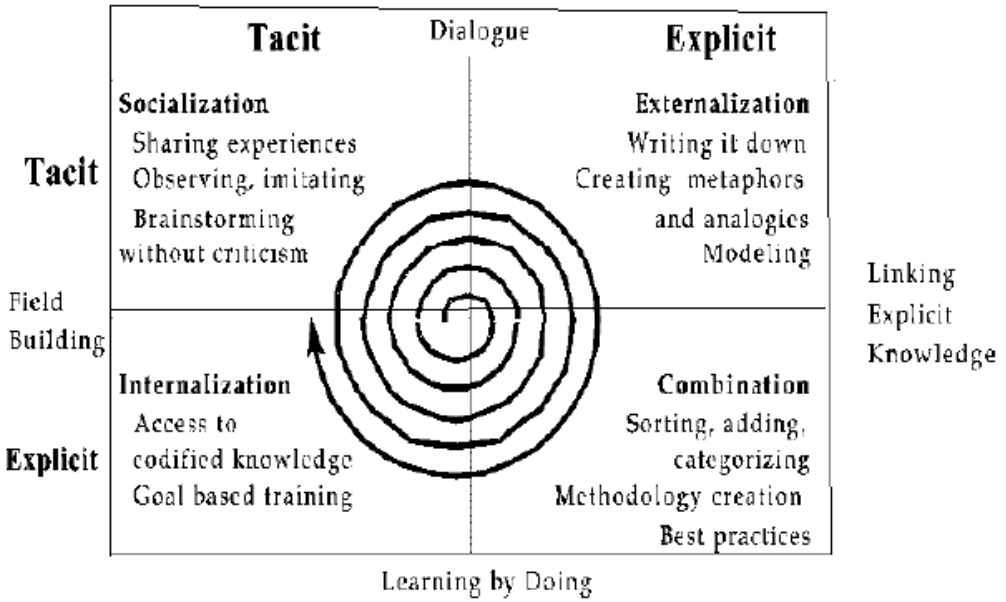
Capturing the people **tacit knowledge** and transforming it into a **corporate "asset"** by formalizing and codifying it

- Improve people's efficiency by explaining and sharing their professional knowledge
- Put the specific professional knowledge of each member at the service of the whole company

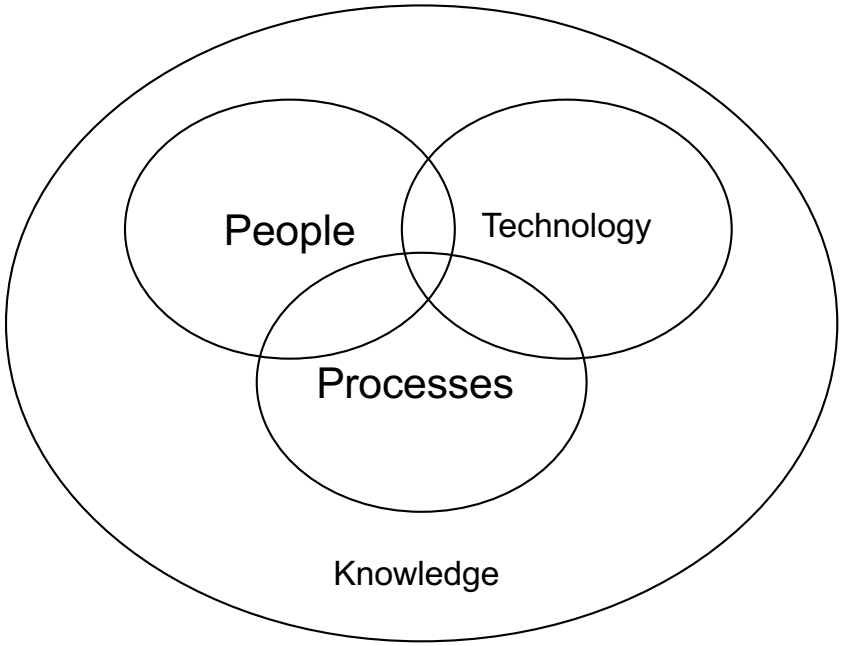
Tacit Knowledge

- People are holders of a type of knowledge that cannot be expressed, "know-how", which cannot be stored or managed with information systems
- Several KM theories claim to be able to capture this tacit knowledge, e.g. Nonaka and Takeuchi and the spiral of knowledge (SECI model, 1995)

*"We **can know more** than we **can tell"***
(Polanyi 1966)



Knowledge Management, Components



KM implies the relationship between people, work processes and technologies to create and share knowledge

KM & KIBS

- Analyze flows of tacit and formalized knowledge into the KIBS
- Conversion process is highly dynamic and produces different and multiform outputs
    - improvement of company internal communication,
    - market understanding,
    - application systems know-how,
    - client negotiation,
    - collaboration,
    - problem-solving,
    - decision-making
    - …

KIBS, knowledge intensive business services

- Acronym is used to indicate both services with a high content of knowledge and organizations that provide these services
- First studies on KIBS (1990s) identified their distinctive function in the unidirectional transfer of information and knowledge from the KIBS to their clients
- The most recent contributions, instead, highlight a more complex process of interaction or "fusion", and co-production of knowledge that involves the KIBS and their clients

- *Suppliers have strong professional knowledge and strong use of technology, services are inputs for industrial processes or for the production of other services* (Miles 1995)

T-KIBS & P-KIBS

- Miles distinguishes:
  - T-KIBS, knowledge-intensive services that create and use new technologies within processes, including, e.g., IT or engineering activities
  - P-KIBS, traditional low-intensity professional services, such as communication, consulting, legal and accounting services

(…like Kang)

KIBS, features

- Two importants facts:
  - The role of **tacit knowledge** in the process
  - High degree of **customization** that generally characterizes KIBS services
- Three key concepts:
  - Knowledge
  - Innovation (KIBS as Innovation hubs or incubators)
  - Territorial proximity (Metropolitan areas, industrial districts …)
- Examples:
  - Accounting;
  - Organizational consultancy;
  - Construction (e.g., topography, civil engineering, architecture);
  - R&D;
  - Design;
  - Computer science and computer-based;
  - Legal services;
  - Marketing and advertising;
  - Training;
  - Financial services;
  - Employment services (temporary);
  - …

KIBS, economic value

- With reference to EU GDP, the share of the value of services is around 70% while in US is 75%
  - Personal services
  - Business services
  - Non Market Services (Education, Health, PA)
- The share of KIBS in GDP is around 11% in the EU, 13% in the US and 8% in Japan
- The contribution of KIBS to GDP growth since 1996 was 17% in the EU, 28% in Japan, and 22% in the US (World Bank 2012)

KIBS, economic value (2)

- KIBS therefore contribute to economic growth taking into account:
  - Growing importance of KIBS sectors in the economy;
  - Role of KIBS as intermediate input (specially in manufacturing);
  - Importance of technology flows between KIBS and companies in the manufacturing sector;
  - Increasing convergence of production and services

KIBS, in industry

- For a manufacturing company, KIBS can be:
  - Cooperation with a professional firm or a design company
  - Cooperation in the design phase with a subcontractor
  - Cooperation with a training institution or a research center
  - Cooperation with retail company
  - Interaction with a competing company
  - Co-Marketing with a company in a complementary sector

KIBS, what are today

- More and more companies use KIBS for intermediate inputs supporting their production, e.g.:
  - In the air transport or banking sector, IT is often outsourced
  - Many big companies have also outsourced personnel management (pay slips, business travel reports, ...)
  - In several manufacturing companies the main KIBS also concern the outsourcing of design services

Manufacturing companies also use KIBS to offer services associated with their traditional physical products

Conclusions

We can generalize:

The "tertiarization" of a company process (e.g., manufacturing) often develops a KIBS area

This tendency is often called "convergence between production and services" or

Servitization